IN THE CLAIMS

We Claim:

Sub A2 1. A heterojunction bipolar transistor (HBT) comprising:

a substrate;

an n+ doped GaN subcollector layer;

an n- doped GaN collector layer;

a base layer formed on top of said collector layer defining a base collector interface formed from alternating layers of A1GaN/GaN forming a superlattice;

an n+ doped AlGaN layer;

an n+ AlGaN emitter layer formed on top of said base layer defining an emitter base interface;

a base contact formed on said base layer;

a collector contact formed on said subcollector; and

an emitter contact formed on said emitter.

2. The HBT as recited in claim 1, wherein the Al concentration in said AlGaN layers is irregular.

Sub A3 3. A heterojunction bipolar transistor (HBT) comprising:

a substrate;

an n+ doped GaN subcollector layer;

an n- doped GaN collector layer;

a base layer formed on top of said collector layer defining a base collector interface formed from alternating layers of A1GaN/GaN forming a superlattice;

an n+ doped AlGaN layer;

an n+ AlGaN emitter layer formed on top of said base layer defining an emitter base interface, the A1 concentration at said emitter base interface being greater at said emitter base interface than said base collector interface;

a base contact formed on said base layer;

a collector contact formed on said subcollector; and

an emitter contact formed on said emitter.

4. The HBT as recited in claim 1, wherein said alternating AlGaN layers are formed such that the Al concentration is graded.

5. A heterojunction bipolar transistor (HBT) comprising:

a substrate formed from a material selected from the group consisting of sapphire and silicon carbide;

an n+ doped GaN subcollector layer;

an n- doped GaN collector layer;

a base layer formed on top of said collector layer defining a base collector interface formed from alternating layers of AlGaN/GaN forming a superlattice;

an n+ doped AlGaN layer;

an n+ AlGaN emitter layer formed on top of said base layer defining an emitter base interface;

a base contact formed on said base layer;

a collector contact formed on said subcollector; and

an emitter contact formed on said emitter.

6. A method for fabricating a heterojunction bipolar transistor comprising the steps:

(a) forming a subcollector layer on a substrate;

(b) forming a collector layer on said subcollector layer;

(c) forming a base layer on said collector defining a base collector interface; said base layer formed with an irregular band gap energy;

(d) forming an emitter layer on said base layer defining a base collector interface; and

(e) forming contacts on said base, subcollector said emitter layers.

7. The process as recited in claim 6, wherein said base layer is formed.

8. A method for fabricating a heterojunction bipolar transistor comprising the steps:

(a) forming a subcollector layer on a substrate;

(b) forming a collector layer on said subcollector layer;

(c) forming a base layer as a superlattice of alternating layers of AlGaN/GaN on said collector defining a base collector interface; said base layer formed with an irregular band gap energy;

(d) forming an emitter layer on said base layer defining a base collector interface; and

(e) forming contacts on said base, subcollector said emitter layers.

9. A method for fabricating a heterojunction bipolar transistor comprising the steps:

(a) forming a subcollector layer on a substrate;

(b) forming a collector layer on said subcollector layer;

(c) forming a base layer comprising a superlattice of alternating layers of AlGaN/GaN having a non-constant concentration of Al in said alternating layers of AlGaN/GaN on said collector defining a base collector interface; said base layer formed with an irregular band gap energy;

(d) forming an emitter layer on said base layer defining a base emitter interface; and

(e) forming contacts on said base, subcollector and emitter layers.

Subb5 10. The process as recited in claim 9, comprising forming said base layer with an Al concentration at said base collector interface being less than the Al concentration at said base emitter interface.

11. A method for fabricating a heterojunction bipolar transistor comprising the steps:

(a) forming a subcollector layer on a substrate;

(b) forming a collector layer on said subcollector layer;

(c) forming a base layer comprising a superlattice of alternating layers of AlGaN/GaN having a non-constant concentration of Al in said alternating layers of AlGaN/GaN on said collector defining a base collector interface such that the A1 concentration is graded between said base collector interface and said emitter base interface said base layer formed with an irregular band gap energy;

(d) forming an emitter layer on said base layer defining a base emitter interface; and

(e) forming contacts on said base, subcollector and emitter layers.